THE OCCURRENCE OF CERCIS ASSOCIATED WITH
THE REMAINS OF SINANTHROPUS

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In a short paper entitled "Evidences of the Use of Fire by Sinanthropus", Dr. Davidson Black has discussed the occurrence of burned bone fragments and charcoal debris in association with the remains of Sinanthropus at Chou Kou Tien, and has concluded that Sinanthropus knew the use of fire. More recently he has sent to our laboratory several fragments of charred wood, one of which is large enough to permit sectioning and determination. Representing as it does a portion of a tree or shrub, which lived in northern China during its occupation by Sinanthropus, this specimen gives a clue as to the nature of the vegetation and the climate in the Chou Kou Tien region during the Pleistocene.

On the basis of the studies of the junior author, this specimen is here described as a new species of Cercis or redbud, which is a member of the family Leguminosae. It is named in honor of Dr. Davidson Black, Honorary Director of the Cenozoic Research Laboratory of the National Geological Survey of China.

Cercis blackii, new species

Plate I, fig. 1.

Description—Growth rings distinct; those examined showed a variation of from .4 mm. to 1.6 mm. in width, with an average width of .7 mm. Vessels of the spring wood appearing in one, two, or occasionally more rows and rarely crowded. Wood distinctly ring porous; the transition from the vessels of the spring wood to those of the late wood sudden and distinct. Spring wood vessels comparatively small; the largest approximately 80 microns in tangential diameter, and appearing circular or oblong in the transverse section. The vessels of the late wood solitary or in short radial rows of from two to five cells, and having a tangential diameter of approximately 30 microns. Xylem parenchyma mostly vasicentric and diffuse but some terminal parenchyma is usual-
by present. Often the vascular parenchyma joins groups of vessels in the late wood and forms short, tangential bands. Xylem rays (Medullary rays) are rather numerous, uniseriate to tetraserrate, heterogeneous, and approximately 500 microns in height. The broad rays often with upper or lower margin uniseriate for from two to five cells; the lower rays often show a tendency to become stoned, and occasionally a distinct stoned condition similar to that of *Cercis texensis* Sarg. may be found.

The vessel segments contain numerous, small, round, or slightly angled, bordered pits arranged in a flat spiral; groups of from two to six pits often connected by a slit-like orifice. Spiral tertiary thickenings are present on the inner walls of the vessels, but, due to their poor preservation, are rather difficult to demonstrate. The vessel segments comparatively long; the length being approximately four times the tangential width.

Fibre walls thin, or of medium thickness, and appearing angled in the transverse section. The walls show conspicuous spiral, or annular, thickenings and small bordered pits that are never numerous. Some fibres may be septic, but this could not be proven on account of the numerous annular thickenings often found on the inner walls of many of them.

Xylem parenchyma rather conspicuous in the transverse section due to the numerous simple pits on their upper and lower walls. Their diameter only slightly greater than that of the fibres and their length being approximately two to four times their breadth.

Xylem ray cells rather short in radial length; the length of the cells in the central portion of the ray being from two to three times the height, while the marginal ray cells have a height greater than, or equal to, the radial length. Pits from the radial walls into the vessels are small and half-bordered; pits on the upper, lower, and tangential walls are simple and rather numerous. Pits leading from the ray cells to the intercellular spaces are usually common and conspicuous.

Discussion—*Cercis blackii* differs from other species of *Cercis* examined in having fewer uniseriate rays, more prominent and more numerous spiral and annular thickenings on the walls of the fibres, and slightly higher xylem rays.
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It shows a closer resemblance to the wood of *C. siliquastrum* L., a modern species of southeastern Europe and Asia Minor than to any of the living species of North America with which it has been compared. The wood of *C. chinensis* Bunge and of other modern Asiatic species has not been available for study, and it seems probable that one of these may prove to be even more nearly related to *C. blackii* than is *C. siliquastrum*.

Prior to sectioning, the specimen was 3 centimeters in length; it is somewhat flattened, and is larger at one end, with a maximum diameter of 2.4 centimeters. It appears to represent the basal portion of a branch, and was recovered by Mr. W. C. Pei from material associated with fossil bones in the Choukoutien Locality 1 deposit.

The material is charred and slightly silicified, and was difficult to section. Sections were made by employing Jeffrey's method for softening and sectioning coal*. After the material had been treated with hot phenol and hydrofluoric acid, it was embedded in celloidin and sectioned on the sliding microtome.

The occurrence of this genus in the Tertiary of Asia has been recorded by Krychofovich*. This record is based on a leaf impression of *C. japonica* from beds of probable Miocene age from Kwannonawa, in the Province of Echigo, Japan; the fossil species is considered by Krychofovich to be closely related to the living *C. chinensis*.

**Occurrence**—Chou K'ou Tien, in Fang Shan Hsien, Chihli Province. From Quarz Horizon 2, in the Ko Tze Tang cave.

**Collection**—National Geological Survey of China, Type, No. C 2000

While as above stated, *Cedrus blackii* shows a closer similarity to the wood of *C. siliquastrum* than to any other living species available for comparison, the modern distribution of *C. chinensis* leads us to believe that this

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*Krychofovich, A. Contributions to the Tertiary Flora of Kwannonawa, Prov. Echigo, Japan, 1926.
may prove to be the most closely related living species. C. chinensis has recently been observed by the senior author in the Western Hills less than a mile from Chou Kou Tien, where it grows as a shrub up to 10 feet in height, with a stem up to 14 inches in diameter. In the later discussion of the fossil flora from quartz Horizon 2, the anatomic relation of C. chinensis to C. blackii will be considered. This modern species is a common shrub in Chihli Province, and is reported south to Kiangsu and west to Hupeh Provinces. It is a typically temperate species, occupying the forest border under conditions of moderate rainfall. The occurrence of wood of Cercis blackii in the deposits associated with those containing the remains of Sinanthropus suggests a climate during this portion of the Pleistocene not greatly unlike that in the region today.

It is clear that no complete picture of a forest, or of the conditions under which it lived, can be envisaged from a single fossil species. Only after the collection of additional fossil plant-material at Chou Kou Tien will it be possible to accurately reconstruct this Pleistocene flora, and determine the physical conditions of its habitat. Even with a large amount of material representing numerous species, it may still be impossible to reconstruct the forest as a whole; for while Sinanthropus may confidently be expected to have gathered his firewood in the immediate vicinity of his home, his selection was almost certainly limited by the strength of his arms or the size of his cutting or felling tools, and the plants he collected for fuel were probably for the most part the smaller trees or shrubs, whose stems and branches he could most readily handle. It is of interest to note that the genus Cercis is a small tree or shrub in the case of all of the living species, both in northeastern Asia and elsewhere in its modern range.

The importance of determining even partially the nature of the vegetation which occupied the Chou Kou Tien region during the Pleistocene is apparent, for this line of evidence may be expected to provide reliable information regarding the climate and topography chosen by Sinanthropus for his homeland.
Explanation of
Plate I.
PLATE 1

Fig. 1—Photomicrograph of Cercis bluchii n. sp. x 93. Transverse section.